CLAIMS

What is claimed is:

Sub B1 1. An optical network system comprising:

a data service hub;

at least one optical tap;

at least one subscriber optical interface connected to the optical tap;

a laser transceiver node disposed between the data service hub and the optical tap, for communicating optical signals between the data service hub and the optical tap, and for apportioning bandwidth between subscribers of the optical network system, and

one or more optical waveguides connected between respective optical taps and the laser transceiver node, for carrying the upstream optical signals and the downstream optical signals, whereby the number of the waveguides is minimized while optical bandwidth for subscribers is controllable by the laser transceiver node in response to subscriber demand.

Sub D1 2. The optical network system of claim 1, wherein the laser transceiver node further comprises an optical tap routing device for apportioning the bandwidth between subscribers of the optical network system.

Sub B2 3. The optical network system of claim 1, wherein the laser transceiver node further comprises:

at least one multiplexer coupled to an optical tap routing device;

at least one optical transmitter connected to the at least one multiplexer, for transmitting downstream optical signals received from the data service hub to at least one subscriber optical interface of the optical network system; and

at least one optical receiver connected to each multiplexer, for receiving and converting upstream optical signals from at least one subscriber optical interface of the optical network system.

4. The optical network system of claim 1, wherein the laser transceiver node further comprises at least one diplexer connected to the at least one optical transmitter and optical receiver, each diplexer combining downstream RF modulated optical signals received from the data service hub with the downstream optical signals, each diplexer being connected to a respective optical waveguide.

Sub D1 5. The optical network system of claim 1, wherein the laser transceiver node accepts gigabit Ethernet optical signals from the data service hub and partitions the Ethernet optical signals into a predetermined number of groups.

6. The optical network system of claim 1, wherein the laser transceiver node comprises passive cooling devices in order to operate in a temperature range between -40 degrees Celsius to 60 degrees Celsius.

7. The optical network system of claim 1, wherein the laser transceiver node is mountable on a strand in an overhead plant environment.

8. The optical network system of claim 1, wherein the laser transceiver node is housed within a pedestal in an underground plant environment.

9. The optical network system of claim 1, wherein a distance between the laser transceiver node and the data service hub comprises a range between zero and eighty kilometers.

10. The optical network system of claim 1, wherein the laser transceiver node comprises at least one optical transmitter, each optical transmitter comprises one of a Fabry-Perot laser, a distributed feedback laser, and a vertical cavity surface emitting laser (VCSEL).

11. The optical network system of claim 1, wherein the laser transceiver node further comprises an optical tap routing device that allocates additional or reduced optical bandwidth to at least one subscriber optical interface relative to other subscriber optical interfaces in the optical network system.

Sub D1 12. The optical network system of claim 1, wherein the laser transceiver node comprises an optical tap routing device that manages upstream and downstream optical signal protocols.

Sub B3 13. The optical network system of claim 11, wherein one of the protocols comprises a time division multiple access protocol.

Sub D1 14. The optical network system of claim 1, wherein data bit rates for the upstream and downstream optical signals are substantially symmetrical.

15. The optical network system of claim 1, wherein each optical waveguide handles data rates of at least 450 Mb/s.

16. The optical network system of claim 1, wherein each optical tap comprises at least one optical splitter.

17. The optical network system of claim 1, wherein one of the optical taps servicing a particular group of subscriber optical interfaces is connected to another optical tap.

18. The optical network system of claim 1, wherein each optical tap propagates upstream and downstream optical signals in addition to downstream RF modulated optical signals.

19. The optical network system of claim 1, wherein each subscriber optical interface comprises an analog optical receiver, a digital optical receiver, and a digital optical transmitter.

20. The optical network system of claim 1, wherein the optical waveguides are a first set of optical waveguides, the optical network system further comprising a second set of optical waveguides disposed between the data service hub and laser transceiver node, the second set comprising a first waveguide for carrying upstream optical signals to the data service hub, and a second optical waveguide for carrying downstream optical signals to the laser transceiver node.

21. An optical network system comprising:

a data service hub;

at least one optical tap;

at least one subscriber optical interface connected to the optical tap;

a laser transceiver node disposed between the data service hub and the at least one subscriber optical interface, for communicating optical signals between the data service hub and the optical tap, and for apportioning bandwidth between subscribers of the optical network system, the optical tap being disposed within the laser transceiver node, and

one or more optical waveguides connected between respective optical taps and the laser transceiver node, for carrying the upstream optical signals and the downstream optical signals, whereby the number of the waveguides is minimized while optical bandwidth for subscribers is controllable by the laser transceiver node in response to subscriber demand.

22. The optical network system of claim 21, wherein each optical tap comprises an optical splitter.

23. The optical network system of claim 21, wherein one of the optical taps servicing a particular group of subscriber optical interfaces is connected to another optical tap.

Sub C3

24. A method for communicating optical signals from a data service provider to at least one subscriber comprising the steps of:

receiving downstream optical signals in a laser transceiver node from the service provider;

dividing the downstream signals between preassigned multiplexers in the laser transceiver node;

apportioning bandwidth between subscribers in the laser transceiver node;

multiplexing the downstream signals at the preassigned multiplexers; and

propagating respective combined downstream optical signals to at least one subscriber via at least one optical tap along at least one optical waveguide.

Sub D1

25. The method of claim ~~24, further~~ comprising the step of assigning subscribers to respective individual multiplexers.

~~26. The method of claim 24, further comprising the steps of:~~

receiving downstream RF modulated optical signals from the service provider; and

combining downstream optical signals with the downstream RF ~~modulated optical signals.~~

Sub D1 27. The method of claim 24, wherein the step of receiving downstream optical signals further comprises the substep of receiving at least one gigabit or faster Ethernet optical signals from the data service provider.

28. The method of claim 24, further comprising the step of operating the laser transceiver node between -40 degrees Celsius and 60 degrees Celsius with passive temperature cooling devices.

29. The method of claim 24, further comprising the step of mounting the laser transceiver node to a strand in an overhead plant environment.

30. The method of claim 24, further comprising the step of housing the laser transceiver node within a pedestal in an underground plant environment.

31. The method of claim 24, further comprising the step of providing one of video, telephone, and internet services via the optical signals.

32. The method of claim 24, further comprising the steps of:

splitting combined downstream optical signals with at least one optical tap; and

propagating the split downstream optical signals to at least one subscriber along at least one optical waveguide.

~~33. The method of claim 24, further comprising the step of connecting between one and sixteen subscribers to a respective optical tap.~~

~~34. The method of claim 24, further comprising the step of feeding one optical tap with optical signals from another optical tap.~~

~~35. The method of claim 24, further comprising the step of servicing between one and sixteen subscribers with the at least one optical waveguide.~~

Sub C4

36. The method of claim 24, wherein the step of converting downstream electrical signals further comprises modulating at least one of Fabry-Perot lasers, distributed feedback lasers, and vertical cavity surface emitting lasers (VCSELs) to generate downstream optical signals.

Sub D1

~~37. The method of claim 24, wherein the step of apportioning bandwidth further comprises the step of allocating additional or reduced optical bandwidth for at least one particular subscriber optical interface relative to other subscriber optical interfaces in the optical network system.~~

Sub C5

38. The method of claim 24, wherein the step of dividing the downstream electrical signals further comprises the substep of using a time division multiplex protocol to divide the downstream electrical signals between preassigned multiplexers.

Sub D1 39. The method of claim 24, further comprising the step of maintaining substantially symmetrical data bit rates between the upstream optical signals and the downstream optical signals.

40. The method of claim 22, further comprising the step of propagating the optical signals at data rates of at least 450 Mb/s.

41. A method for communicating optical signals from at least one subscriber to a data service provider comprising the steps of:

propagating upstream optical signals originating from at least one subscriber to at least one optical tap;

receiving upstream optical signals at a laser transceiver node from the at least one optical tap;

converting the upstream optical signals to electrical signals at the laser transceiver node;

combining upstream electrical signals in the laser transceiver node;

apportioning bandwidth for at least one subscriber in the laser transceiver node;

converting the combined upstream electrical signals into optical signals; and

propagating the combined upstream optical signals to the data service provider along at least one optical waveguide.

42. The method of claim 41, further comprising the step of operating the laser transceiver node between -40 degrees Celsius and 60 degrees Celsius with passive temperature cooling devices.

43. The method of claim 41, further comprising the step of mounting the laser transceiver node to a strand in an overhead plant environment.

44. The method of claim 41, further comprising the step of housing the laser transceiver node within a pedestal in an underground plant environment.

45. The method of claim 41, further comprising the step of providing one of video, telephone, and internet services via the optical signals.

46. The method of claim 41, further comprising the step of combining respective upstream optical signals originating from a plurality of subscribers with at least one optical tap.

47. The method of claim 41, further comprising the step of connecting between one and sixteen subscribers to a respective optical tap.

48. The method of claim 41, further comprising the step of positioning the laser transceiver node closer to the optical taps relative to the data service provider.

49. The method of claim 41, further comprising the step of feeding one optical tap with optical signals from another optical tap.

50. The method of claim 41, further comprising the step of servicing between one and sixteen subscribers with single optical waveguides connected to respective individual multiplexers.

51. The method of claim 41, further comprising the step of maintaining substantially symmetrical data bit rates between the downstream optical signals and the upstream optical signals.

52. The method of claim 41, further comprising the step of propagating the optical signals at data rates of at least 450 Mb/s.

add E1